IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Denys et al.	Docket No.:	8459.008.US0000
Application No.:	10/520,480	Examiner:	FOGARTY
Filed:	6/21/2005	Art Unit:	1793
Customer No.:	77213	Confirmation No.:	5517

For: Metallurgical vessel

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

DECLARATION PURSUANT TO 37 C.F.R. § 1.132

Sir:

I, Koenraad Meijer, declare and state as follows:

1. My educational background includes a master's degree in mechanical engineering from the Technical University in Delft, the Netherlands.

2. I have been employed by Corus from 1987, where I am currently Senior Researcher in the Ironmaking department, my employer is the assignee Corus Technology BV.

3. I am an inventor or co-inventor on at least six U.S. patents and one pending patent application relating to ironmaking and I am the author of numerous technical publications relating to this technology.

4. I am a co-inventor of the invention claimed in the above identified application.

5. I understand there is an Advisory Action of October 9, 2008, against the present patent application containing the following rejections:

I. Claims 1, 5 - 8, 10, 16 and 17 under 35 U.S.C §103(a) over US 5,662,860 to Klaassen et al. (hereinafter, "Klaassen") and US 5,769,9823 to Nishikawa et al. (hereinafter, "Nishikawa"); and

II. Claims 13 – 15 under 35 U.S.C §103(a) over Klaassen, Nishikawa, and US 5,733,358 to Geiger et al. (hereinafter, "Geiger").

6. Present Claim 1 states each feed chute is positioned for passing the solids downwardly through the roof between a respective said lance and the sidewall of the metallurgical vessel in a radial direction.

7. To give context to the location of the lance, present Claim 1 also says the vessel has a lance arrangement of at least three lances for supplying oxygen containing gas to the interior of the vessel in operation with the lance discharge end not extending into a region of the vessel interior below the center opening, wherein the lance discharge end is positioned and directed for achieving in operation a substantially downwardly directed flow of post-combusted gases at the side wall of the vessel and a substantially upwardly directed flow of post- combusted gases in the centre of the vessel.

8. Klaassen shows coal being supplied by means of chute 22, which is not positioned between a lance and the sidewall of the metallurgical vessel in a radial direction.

9. However, the Advisory Action states Applicant has not submitted factual evidence to support the argument that the position of chute 22 of Klaassen is not a functional equivalent of the position of the chute in the presently claimed metallurgical vessel.

10. A serious operating problem of smelting reduction processes is the carry over of fine coal particles with the process gas. An important

invention of the present application is the selected position of the coal feed chute which results in unexpected advantages in minimizing this carry over.

11. Klaassen states a smelting reduction process and apparatus will have a feed chute to feed coal into the smelt. However, Klaassen does not disclose or claim the specific position of this feed point presently claimed.

12. Klaassen positions the coal feed chute 22 to downwardly feed coal into the substantially upward flow of the post-combusted gas. Also, the feed chute discharge opening is at a completely different location than in the present invention. Klaassen locates the discharge opening of coal feed chute 22 above the lances and in the central region of the metallurgical vessel to feed and drop into the foam. As such, material fed to the vessel by means of the Klaassen chute 22 may be blown out of the vessel, because of the position of the chute 22 in the upward flow of gases.

13. The present invention resulted after intensive computer modeling, of the gas flow field and combustion process above the melt. From this modeling it appeared the lowest carry over of coal fines would result from locating the coal feed positions relatively near to the oxygen lance in a multi lance configuration, by placing the coal feed positions between the lance and the vessel wall, with the lance discharge end away from the center of the vessel. The multi lance configuration would result in a downwards flow behind the lances that carries coal fines to the bath.

14. This modeling included investigating the gas flow pattern in the cyclone converter furnace by means of computational fluid dynamic models based on a finite volume method for which the software FLUENT Unstructured version 4.2.10 was used. The grid necessary for the calculations was generated with the GEOMESH mesh generation program from Fluent Incorporated. The GEOMESH program is a modeling tool developed for automating finite element grid generation. The starting point for the calculations comprised a gas zone with a diameter of 7 m, a freeboard height of 5 m, a lance-slag distance of 1.5 m and a post combustion ratio of about

40% and a heat transfer efficiency of about 95%. The corresponding conditions of gas production and for oxygen supply and coal supply were derived using a proprietary dynamical process model for cyclone converter furnaces. Because of symmetry, calculations were only performed for a segment of 60 degrees.

15. Figures 3 and 4 of the present application illustrate examples of these computer simulations. Figure 3 shows the results of a simulation of a system in which a chute is positioned according to the present invention. Figure 4 shows the results of a simulation of a system in which a chute is positioned between the lances consistent with Klaassen.

16. As stated on page 8, lines 27 – 31 of the specification: "Figure 3 shows a section of the vessel 1, a lance 3 projecting into the section of the vessel and the trajectories 15 of coal particles added to the vessel. The advantage obtained by adding coal particles a short distance from the lances is clear as the particles are entrained towards the slag layer with the substantially downward flow of post-combusted gases at the sidewall of the vessel."

17. In contrast, as illustrated in Figure 4 and explained at page 8, lines 31 – 34 of the present specification, when the chute is positioned between the lances, "the majority of the particles are entrained in the upwardly directed flow of post-combusted gases in the centre of the vessel and leave the vessel."

18. Thus, the position of chute 22 of Klaassen is not a functional equivalent of the position of the chute in the presently claimed metallurgical vessel.

19. Also, Claim 1 recites the lance discharge end not extending into a region of the vessel interior below the center opening, as supported by Figure 1. Klaassen does not disclose this. This feature is advantageous because post combustion gases are rising in the central portion and would

conflict with the downwardly directed gas from the lances.

20. Claim 10 recites the lances are positioned to avoid contact with molten material passing downwards from the melting cyclone to the metallurgical vessel. Klaassen does not disclose this. This feature is advantageous because the molten pre-reduced iron oxide 14 falling down from the melting cyclone 38 into the vessel 31 would damage the lances, as explained at page 5, lines 20-23; see also molten iron 14 dropping from the melting cyclone 2 in Figure 1.

21. I further declare that all statements and representations made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements and representations were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued therefrom.

Date: 15 January 2009 By: _____

Koenraad Meijer